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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/523,611	02/07/2005	Shigeru Yamago	2005-0119A	1336

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EXAMINER	
BERNSHTEYN, MICHAEL	
ART UNIT	**PAPER NUMBER**
1713	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	03/20/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 03/20/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/523,611	YAMAGO ET AL.	
	Examiner	Art Unit	
	Michael Bernshteyn	1713	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 December 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) *7-12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 13-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-27* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action follows a response filed on December 22, 2006. Claims 1 and 6 have been amended; no claims have been added or cancelled.

2. In view of the Declaration, the rejection of claims 1-6 and 13-27 under 35 U.S.C. 102(a) as being anticipated by Yamago et al. has been withdrawn.

3. Applicant's arguments, see Remarks (pages 7-9), filed December 22, 2006, with respect to claims 1-6 and 13-27 have been fully considered and are persuasive. The rejection of claims 1-6 and 13-27 under 35 U.S.C. 103(a) as being unpatentable over Yamago et al. in view of Leonard et al. has been withdrawn.

4. Claims 1-6 and 13-27 are active.

Claim Rejections - 35 USC § 103

5. The text of this section of Title 35 U.S.C. not included in this action can be found in a prior Office Action.

6. Claims 1-6 and 13-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamago et al. ("Organotellurium Compound as Novel Initiators for Controlled/Living radical Polymerizations. Synthesis of Functionalized Polystyrenes and End-Group Modifications", Journal of the American Chemical Society, 124 (12), 2874-2875, 2002.02.27) in view of Goto et al. ("Mechanism-Based Invention of High-Speed Living Radical Polymerization Using Organotellurium Compounds and Azo-Initiators", Journal of the American Chemical Society, 2003, 125, 8720-8721).

With regard to the limitation of claims 1-6 and 13-27, Yamago discloses the advantages of organotellurium compound compounds over nitroxides, e.g., more facile synthesis of tailor-made initiators and easy of polymer-end group modifications, would be highly useful in the synthesis and synthetic transformations of these compounds.

Yamago discloses several new organotellurium-based initiators for cotrolled/ living radical polymerization of styrene derivatives that allows accurate weight controlwith defined end-groups, which can be transformed into a variety of end-group modified polystyrenes (page 2874, 1st column, 2nd paragraph).

Yamago discloses bulk polymerization of styrene (X=H) with the polymeric-end mimetic initiator 1a (R=Me) initiated the polymerization efficiently, and afforded polystyrene with the predicted molecular weight and low polydispersity (M_n = 9200, PD = 1.17) in 96% yield (Table 1, entry 1).

Scheme 1

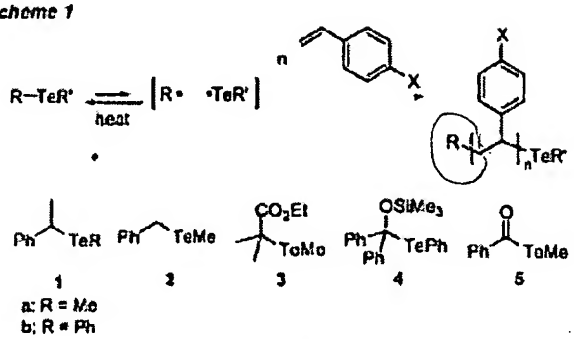


Table 1. Effects of Initiators for Polymerization of Styrene[a]

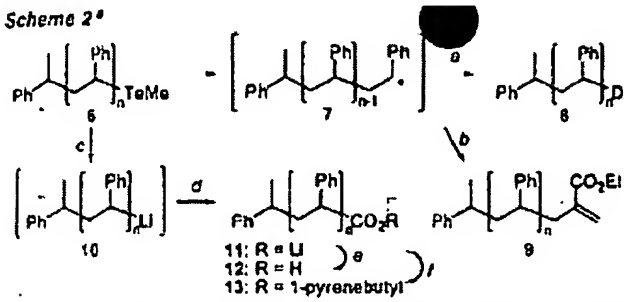
entry	X	initiator	conversion (%)	M_n[b]	PD[b]	BDE (kJ/mol)[c]
1	H	1a	96	9 200	1.17	123
2	H	1b	91	15 900	1.45	112
3	H	2	89	9 000	1.46	142
4	H	3	79	9 000	1.15	114
5	H	4	76	50 700	1.80	25
6	H	5	83	25 400	1.58	182
7[d]	H	1a	78	35 700	1.21	
8[e]	H	1a	84	62 600	1.30	
9	Cl	1a	88[f]	8 800	1.41	
10	OMe	1a	94[g]	10 900	1.17	

[a] Bulk polymerization was carried out with 100 equiv of styrene at 105 °C for 16–18 h under a nitrogen atmosphere. [b] Molecular weight (M_n) and polydispersity (PD) were calibrated by size exclusion chromatography using polystyrene standards for samples after single precipitation from MeOH. [c] Bond dissociation energy of the initiator obtained by B3LYP DFT calculations with the LANL2DZ basis set for tellurium atom and the 6-31G(d) basis set for the rest. [d] The reaction was carried with 500 equiv of styrene. [e] The reaction was carried out with 1000 equiv of styrene. [f] The reaction was carried out at 100 °C for 17 h. [g] The reaction was carried out at 100 °C for 36 h.

It is the Examiner position, that organotellurium compounds of the above formulas 1a, 1b, 2 are substantially identical to the claimed formula (1).

The initiators 1a and 3 promoted polymerization under much milder conditions. Molecular weight increased linearly with increase of styrene, and the products were obtained with low polydispersity (entries 7 and 8).

Scheme 2[a]



[a] AIBN (0.1 equiv), Bu_3SnD (3 equiv), $C_6H_5CF_3$, 80 °C, 4 h. [b] AIBN (0.1 equiv), ethyl tributylstannylmethylacrylate (4 equiv), $C_6H_5CF_3$, 80 °C, 5 h. [c] BuLi (1.5 equiv), THF, −72 °C, 3 min. [d] CO_2 (excess). [e] Aqueous HCl (excess). [f] 2,4,6-$Cl_3C_6H_2COCl$ (2 equiv), Et_3N (2 equiv), THF, room temperature, 1.5 h, then 1-pyrenebutanol (4 equiv), DMAP (4 equiv), CH_2Cl_2, room temperature, 3 h.

The "living" nature of the current polymerization was ascertained by several control experiments. First, the molecular weight (M_n) increased linearly with an increase in the amount of styrene used. Second, the molecular weight also increased linearly with an increase of the conversion of styrene. Third, a block copolymer was formed by the treatment of starting polystyrene block prepared from 1a and 100 equiv of styrene with 4-methoxystyrene (100 equiv). Finally, the high level of fidelity of the end-group was confirmed by labeling experiments. Thus, treatment of polymer block 6 prepared from 1a and 100 equiv of styrene with tributyltin deuteride afforded 8 quantitatively through the radical intermediate 7 (page 2875, 1st column, 1st paragraph).

Yamago does not disclose the use of compound represented by the formula (2).

With regard to the limitation of claims 1-5, Goto discloses organotellurium-mediated living radical polymerization (TERP) of styrene, acrylate, and methylacrylate derivatives in the presence of 2,2'-azobisisobutyronitrile (AIBN) or 2,2'-azobis(2,4,4-trimethylpentane) as a radical source. Such polymerization process can be completed within 2-11 h and 40-60°C and gives the desired polymers with the expected molecular

weight and narrow molecular weight distribution (page 8720, left column, 2nd paragraph). The results are in the table 1 (page 8721):

Table 1. Polymerization with 4 in the Presence of AIBN

entry	monomer[a]	method[b]	conditions (°C/h)	yield (%)	M_n[c]	PDI[c]
1	St	A	60/11	94	11300	1.17
2	St	A[d]	60/11	82	4300	1.11
3	St	A[e]	40/23	82	7400	1.21
4	St	B	100/16	96	9200	1.17
5	BA	A	60/4	99	15900	1.19
6	BA	B	100/24	89	10300	1.13
7	MMA	A	60/2	93	11000	1.36
8[f]	MMA	A	60/2	98	9600	1.15
9[f]	MMA	B	80/13	92	9700	1.18
10[g]	NIPAM	A	60/3	99	30500	1.09
11[g]	AN	A	60/6	99	37800	1.16
12[g]	HEMA	A	60/2	99	22300	1.18

[a] St: styrene, BA: *n*-butyl acrylate, MMA: methyl methacrylate, NIPAM: *N*-isopropyl acrylamide, AN: acrylonitrile, HEMA: 2-hydroxyethyl methacrylate. [b] A: A mixture of 4 (1 equiv), AIBN (1 equiv) and monomer (100 equiv) was heated. B: A mixture of 4 (1 equiv) and monomer (100 equiv) was heated.[3] [c] Number-average molecular weight (M_n) and polydispersity index (PDI) were obtained by size exclusion chromatography calibrated by polySt standards for entries 1–4 and 11 and polyMMA standards for others. [d] Two equivalents of 4 was used. [e] V-70 was used instead of AIBN. [f] Dimethyl ditelluride (1 equiv) was added. [g] Reaction was carried out in DMF.

Goto discloses the usage of **dimetyl ditelluride** compound represented by formula (2) during the polymerization of poly(methyl methacrylate) with low polydispersity (entry 8 in table 1).

Both references are analogous art because they are from the same field of endeavor concerning using tellurium derivatives for polymerization process of vinyl monomers.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate tellurium compounds, such as dimethyl ditelluride, etc. as taught by Goto in Yamago's polymerization process of vinyl monomers because poly(methyl methacrylate) with low polydispersity was obtained by the addition of dimethyl ditelluride (Goto's reference, page 8721, 2nd paragraph), and

thus to arrive at the subject matter of instant claim 1 and dependable claims 2-6 and 13-27.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Bernshteyn whose telephone number is 571-272-2411. The examiner can normally be reached on M-F 8-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Michael Bernshteyn
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03/09/2007

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